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## FOREIGN TECHNOLOGY DIVISION



DEVELOPMENT OF FINITE LOCAL PERTURBATIONS OF ELECTRICAL CONDUCTIVITY IN  
THE FLOW OF A WEAKLY-CONDUCTING GAS WHEN A MAGNETIC FIELD IS PRESENT

by

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## HUMAN TRANSLATION

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# U. S. BOARD ON GEOGRAPHIC NAMES transliteration SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

\*ye initially, after vowels, and after Ъ, ь; e elsewhere.  
When written as ѐ in Russian, transliterate as yѐ or ѐ.

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	$\operatorname{sech}^{-1}$
cosec	csc	csch	csch	arc csch	$\operatorname{csch}^{-1}$

Russian English

rot curl  
lg log

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DEVELOPMENT OF FINITE LOCAL PERTURBATIONS OF  
ELECTRICAL CONDUCTIVITY IN THE FLOW OF A  
WEAKLY-CONDUCTING GAS WHEN A MAGNETIC  
FIELD IS PRESENT

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A.P. Favorskiy (IMP)

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A study has been made of the possibility of development of a T-layer [1] from local finite perturbation of electrical conductivity introduced artificially into a steady-state flow of a weakly-conducting gas. The analysis is made with the help of a numerical solution of equations of magnetic hydrodynamics, formulated in the assumption that the electron, ion and neutral components of the medium are found in thermodynamic equilibrium: the viscosity, Hall effect and transfer of energy by radiation are not taken into account.

A steady-state flow of a radial supersonic source of gas is used as the initial steady-state flow of gas (Fig. 2.16). The flow is analyzed when  $r > r_0$ . In the section  $r = r_0$  the number  $M > 1$ . The gas is a mixture of argon with an additive of 0.1% cesium. At the initial moment of time in the steady-state flow in the area  $r_0 < r < r_1$  there is an increase of temperature up to the magnitude  $T = \tilde{T}$ . The goal of this work is investigating the levels, at which this initial perturbation of temperature will develop into a T-layer. The magnitudes of the

strength of the magnetic field and the initial temperature of perturbation varied as the parameters. Figure 2.18 gives a characteristic example of the development of the process.

An analysis of the calculation results showed that there is a fundamental possibility of inducing a T-layer with the help of a local finite perturbation of electrical conductivity.

The nature of the process depends on the parameter of hydromagnetic interaction  $R_m = Re_m \cdot R_\sigma = \frac{4\pi}{c^2} G V L \frac{H_0^2}{8\pi p}$ , calculated based on the variables in the zone of perturbation. It is shown that there is a critical value of the parameter  $R_m^*$  such that if  $R_m < R_m^*$  the disturbance of temperature will not lead to noticeable changes in the course of the process. If  $R_m > R_m^*$ , then a T-layer develops (Fig. 2.18).

Figure 2.17 shows the curve  $Re_m R_\sigma = R_m^*$ , separating the area of existence of the T-layer (upper section) from the area where the presence of perturbations in the flow does not lead to any serious changes in the process.

The variable  $R_m^*$  depends on the nature of the steady-state flow of gas (from the stage of expansion of the gas in this flow).

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